Contribution to face the FAW challenge in West and Central Africa

Silvie P.

@P.Silvie, Brazil

Expert Meeting on FAW – Accra, Ghana, July 18-20

Outline

The Current situation

IPM Components

Potential contribution of some French-speaking networks

@P.Silvie, Brazil

Outline

The Current situation: diversity

IPM Components

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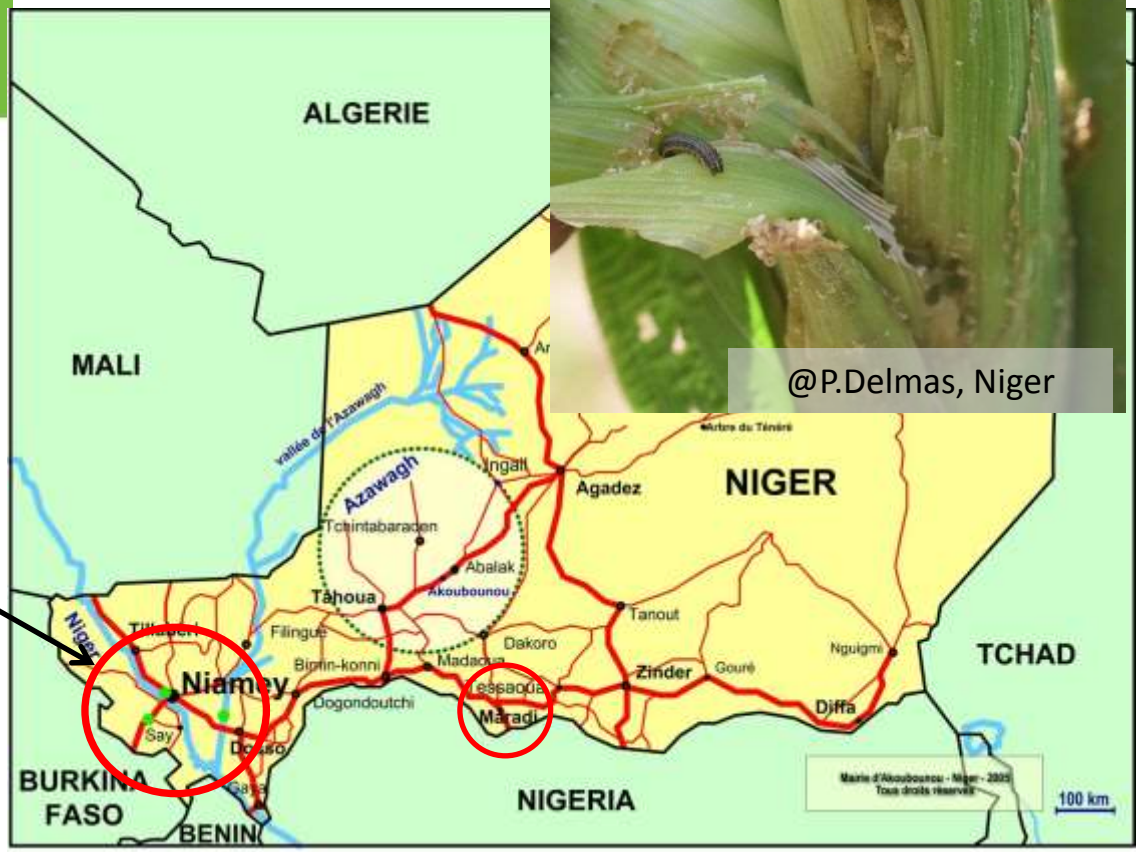
The current distribution in sub-Saharan Africa (everywhere !)



@P.Delmas, Niger

Niari Valley, Congo, Nov. 2016 (G. Bani, pers. comm.)

Diversity of agroecosystems (1/5)

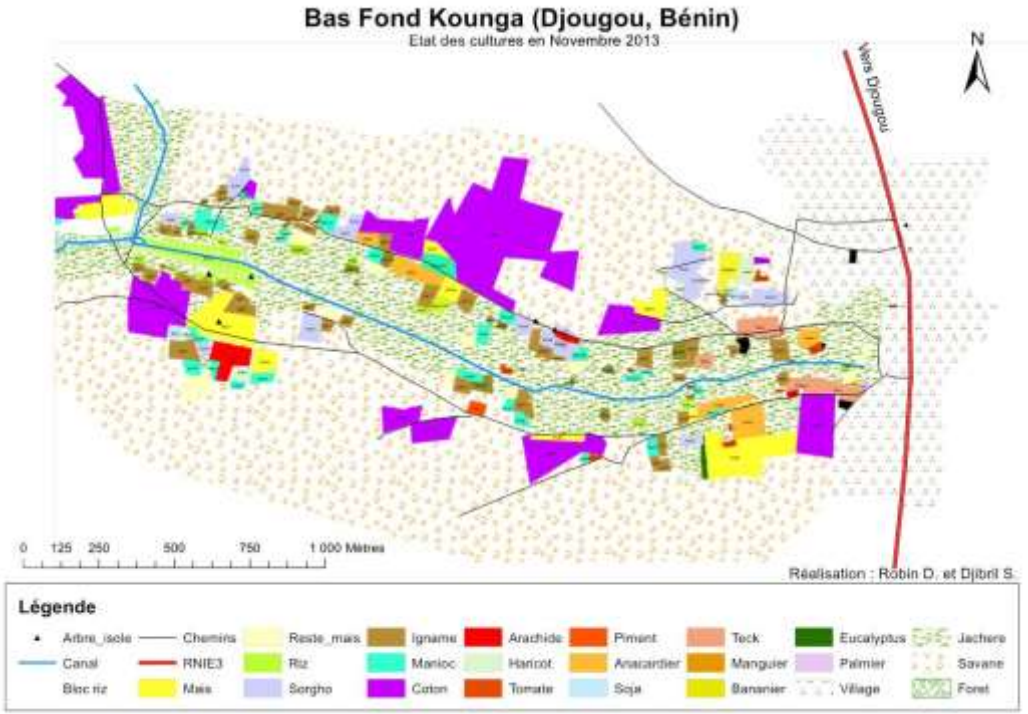
Smallholders

Breeders

Intercropping

Push pull strategy

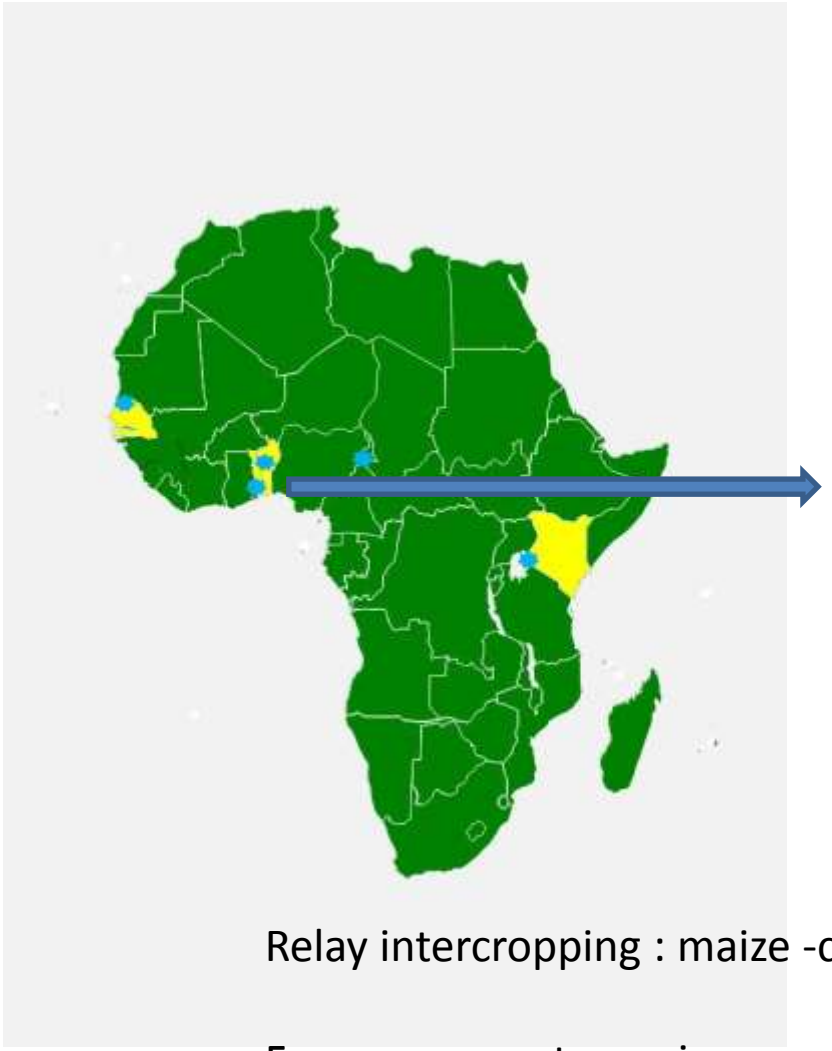
Diversity of agroecosystems (2/5)



Small plots, diversity of crops,
50% without any crop

Two seasons: Rainy and dry seasons

Diversity of agroecosystems (3/5)



Relay intercropping : maize -cotton

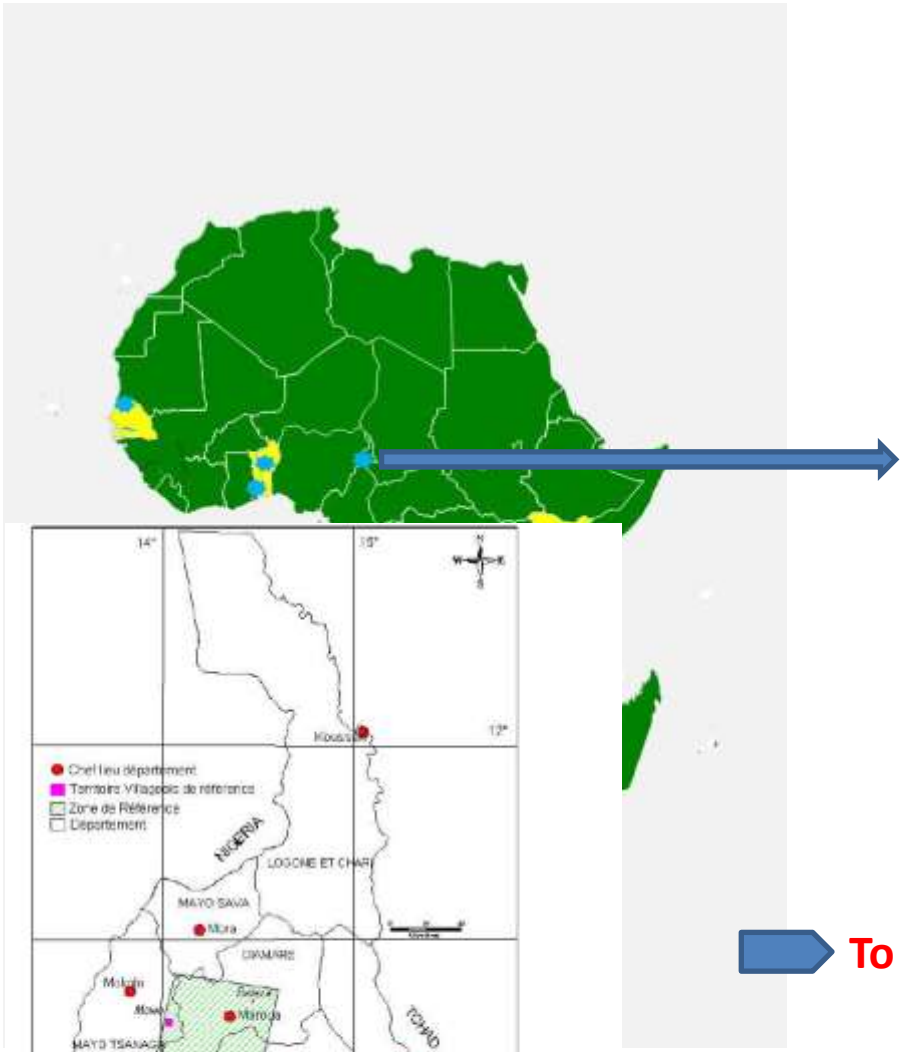
Four seasons: two rainy seasons

Diversity of agroecosystems (4/5)

@Oberline Fokou, Sénégal (Guede Chantier- Jan2017)

Sorghum - irrigation

Diversity of agroecosystems (5/5)



Muskuwaari crop (Sorghum)

One rainy season: June to November

To characterize each agroecosystem/FAW

Drought sequences is a concern

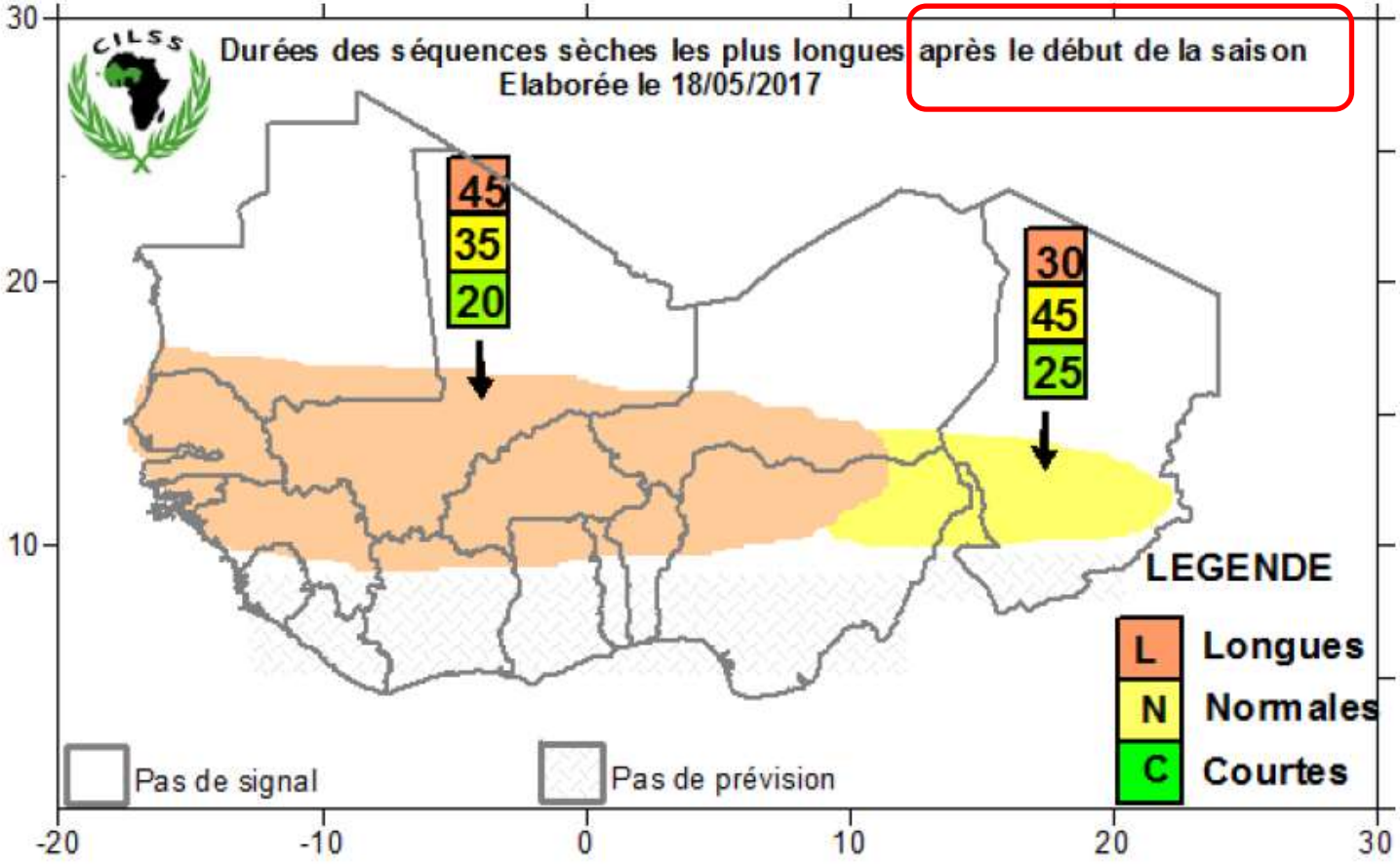


Figure 3.2 : Prévision des durées de séquences sèches les plus longues après les dates de début de la saison des pluies 2017, pour les pays de la zone Sahélo-soudanienne de l'espace CILSS/CEDEAO, comparativement à la période de référence 1981-2010

To characterize the climatic context

A tribute to the past !

THE FALL ARMY WORM

PHILIP LUGINBILL FEBRUARY, 1928

TECHNICAL BULLETIN No. 34

Irregularity of infestations

1899 « first general outbreak »
1912
1915
1920

Georgia
1854 – 1872 – 1874 - 1878

Migration

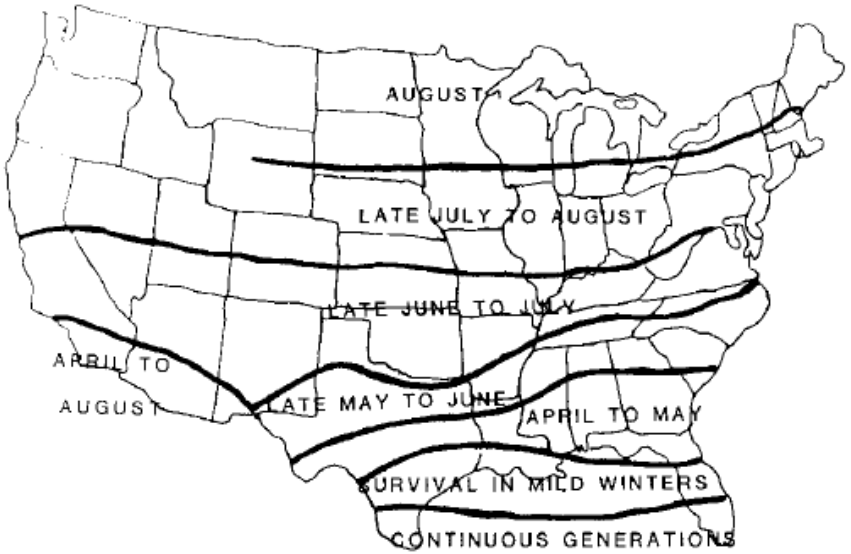


Fig. 2. Annual northward progress of fall armyworm and areas of continuous generations and of survival in mild winters in the United States.

S. J. JOHNSON

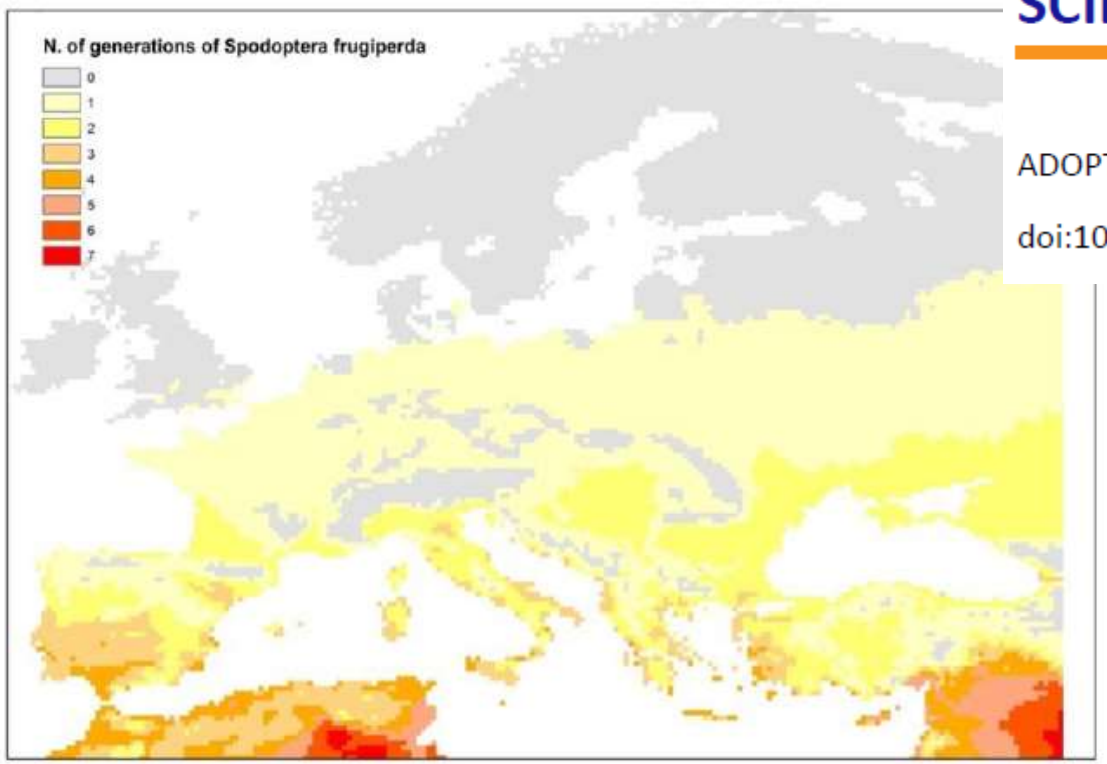
Insect Sci. Applic. Vol. 8, Nos 4/5/6, pp. 543–549, 1987

To characterize the modalities of infestations (modelling –forecasting)

The next future: is Europe threatened ?

Pest categorisation of *Spodoptera frugiperda**

EFSA Panel on Plant Health (PLH),



SCIENTIFIC OPINION

ADOPTED: 28 June 2017

doi:10.2903/j.efsa.2017.4927

Figure 3 – Preliminary estimate mapping the potential number of generations of *S. frugiperda* possible per year.

Outline

The Current situation

IPM Components: a short review (from the plot to the landscape)

Potential contribution of some French-speaking networks

@P.Silvie, Brazil

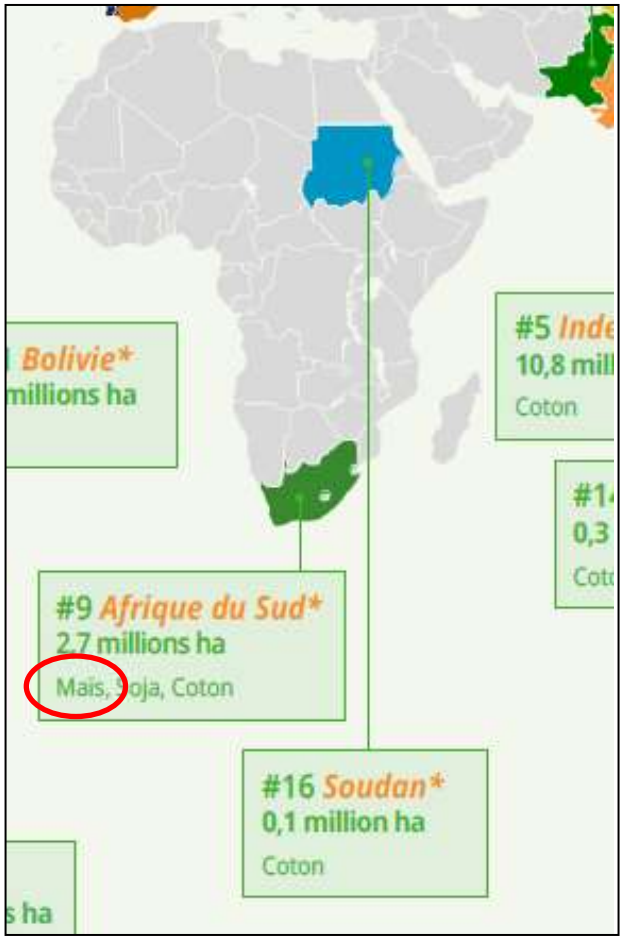
Host plants and HP resistance ?

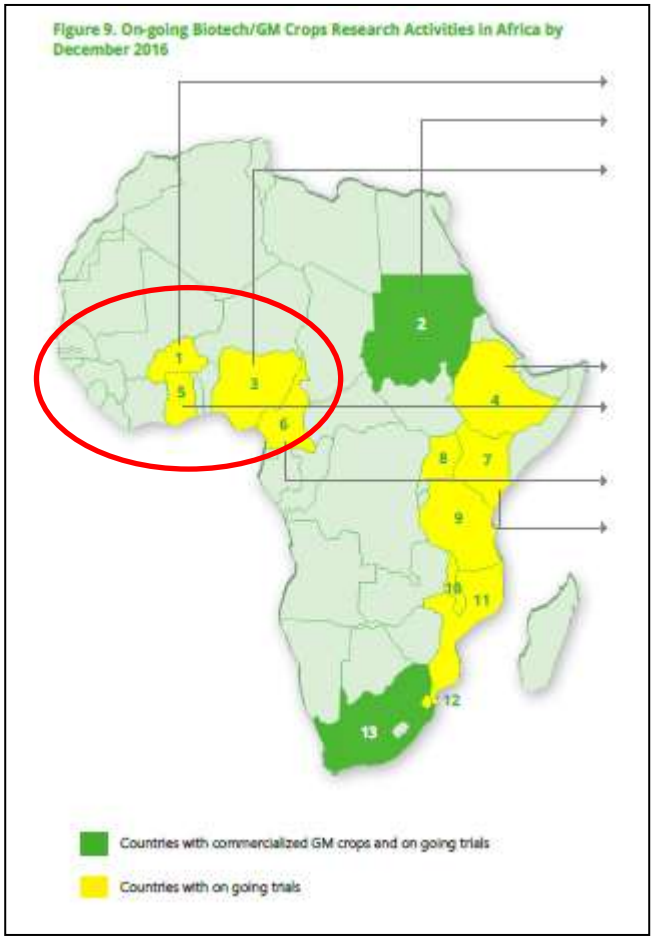
Agrostis (bentgrasses), *Agrostis gigantea* (black bent), *Alcea rosea* (Hollyhock), *Allium*, *Allium cepa* (onion), *Amaranthus* (amaranth), *Andropogon virginicus* (broomsedge), *Arachis hypogaea* (groundnut), *Asparagus officinalis* (asparagus), *Atropa belladonna* (deadly nightshade), *Avena sativa* (oats), *Beta*, *Beta vulgaris* (beetroot), *Beta vulgaris* var. *saccharifera* (sugarbeet), *Brassica oleracea* (cabbages, cauliflowers), *Brassica oleracea* var. *capitata* (cabbage), *Brassica oleracea* var. *viridis* (collards), *Brassica rapa* subsp. *oleifera* (turnip rape), *Brassica rapa* subsp. *rapa* (turnip), Brassicaceae (cruciferous crops), *Capsicum* (peppers), *Capsicum annuum* (bell pepper), *Carex* (sedges), *Carya* (hickories), *Carya illinoinensis* (pecan), *Cenchrus incertus* (Spiny burrgrass), *Chenopodium album* (fat hen), *Chenopodium quinoa* (quinoa), *Chloris gayana* (rhodes grass), *Chrysanthemum* (daisy), *Chrysanthemum morifolium* (chrysanthemum (florists')), *Cicer arietinum* (chickpea), *Citrullus lanatus* (watermelon), *Citrus aurantium* (sour orange), *Citrus limon* (lemon), *Citrus reticulata* (mandarin), *Citrus sinensis* (navel orange), *Codiaeum variegatum* (croton), *Convolvulus* (morning glory), *Cucumis sativus* (cucumber), Cucurbitaceae (cucurbits), *Cyperus rotundus* (purple nutsedge), *Dahlia pinnata* (garden dahlia), *Dianthus caryophyllus* (carnation), *Echinochloa colona* (junglerice), *Eryngium foetidum*, *Fagopyrum esculentum* (buckwheat), *Fragaria ananassa* (strawberry), *Fragaria chiloensis* (Chilean strawberry), *Gladiolus* hybrids (sword lily), ***Glycine max*** (soybean), ***Gossypium*** (cotton), *Gossypium herbaceum* (short staple cotton), *Hevea brasiliensis* (rubber), *Hibiscus cannabinus* (kenaf), *Hordeum vulgare* (barley), ***Ipomoea batatas*** (sweet potato), *Ipomoea purpurea* (tall morning glory), *Lactuca sativa* (lettuce), *Malus domestica* (apple), *Medicago sativa* (lucerne), ***Mucuna pruriens*** (velvet bean), *Musa* (banana), *Nicotiana tabacum* (tobacco), *Panicum miliaceum* (millet), *Pelargonium* (pelargoniums), *Pennisetum clandestinum* (kikuyu grass), ***Pennisetum glaucum*** (pearl millet), *Phaseolus* (beans), ***Phaseolus vulgaris*** (common bean), *Phleum pratense* (timothy grass), *Pisum sativum* (pea), *Platanus occidentalis* (sycamore), *Plumeria (frangipani)*, *Poa annua* (annual meadowgrass), *Poa pratensis* (smooth meadow-grass), Poaceae (grasses), *Portulaca oleracea* (purslane), *Prunus persica* (peach), *Secale cereale* (rye), *Setaria italica* (foxtail millet), *Setaria viridis* (green foxtail), *Solanum* (nightshade), ***Solanum lycopersicum*** (tomato), ***Solanum melongena*** (aubergine), ***Solanum tuberosum*** (potato), *Sorghum caffrorum*, *Sorghum halepense* (Johnson grass), *Sorghum sudanense* (Sudan grass), *Spinacia oleracea* (spinach), *Trifolium* (clovers), *Trifolium pratense* (purple clover), *Trifolium repens* (white clover), *Triticum aestivum* (wheat), turfgrasses, *Urochloa*, *Vaccinium corymbosum* (blueberry), ***Vigna unguiculata*** (cowpea), *Viola* (violet), *Vitis* (grape), *Vitis vinifera* (grapevine), *Xanthium strumarium* (common cocklebur), *Zea mays* subsp. *mays* (sweetcorn), *Zea mays* subsp. *mexicana* (teosinte), ***Zingiber officinale*** (ginger).

GM Plants ?

ISAAA

BRIEF 52





Regulation by natural enemies ?

Parasitoïdes

Source: Groot et al., 2017. Practical Challenges to Inundative and Inoculative Biocontrol (BINGO Project)

Trichogrammes

Viruses ?

http://www.lancaster.ac.uk/armyworm/biological-control/strategic-control

SpexNPV

African armyworm

@P.Silvie, Chad, 1987

NPV Processing Laboratory, Arusha, Tanzania (March 2013)

?? Andermatt Biocontrol

Littovir ®

Spexit®

Mechanical destruction ?

THE FALL ARMY WORM

PHILIP LUGINBILL

FEBRUARY, 1928

TECHNICAL BULLETIN No. 34

FIG. 35.—Ditch prepared to entrap fall army worms. A log dragged back and forth through the ditch crushes the worms that have fallen into it. (Walton)

FIG. 36.—A land roller which may be used to crush larvae while they are crossing a smooth road. (Webster and Phillips)

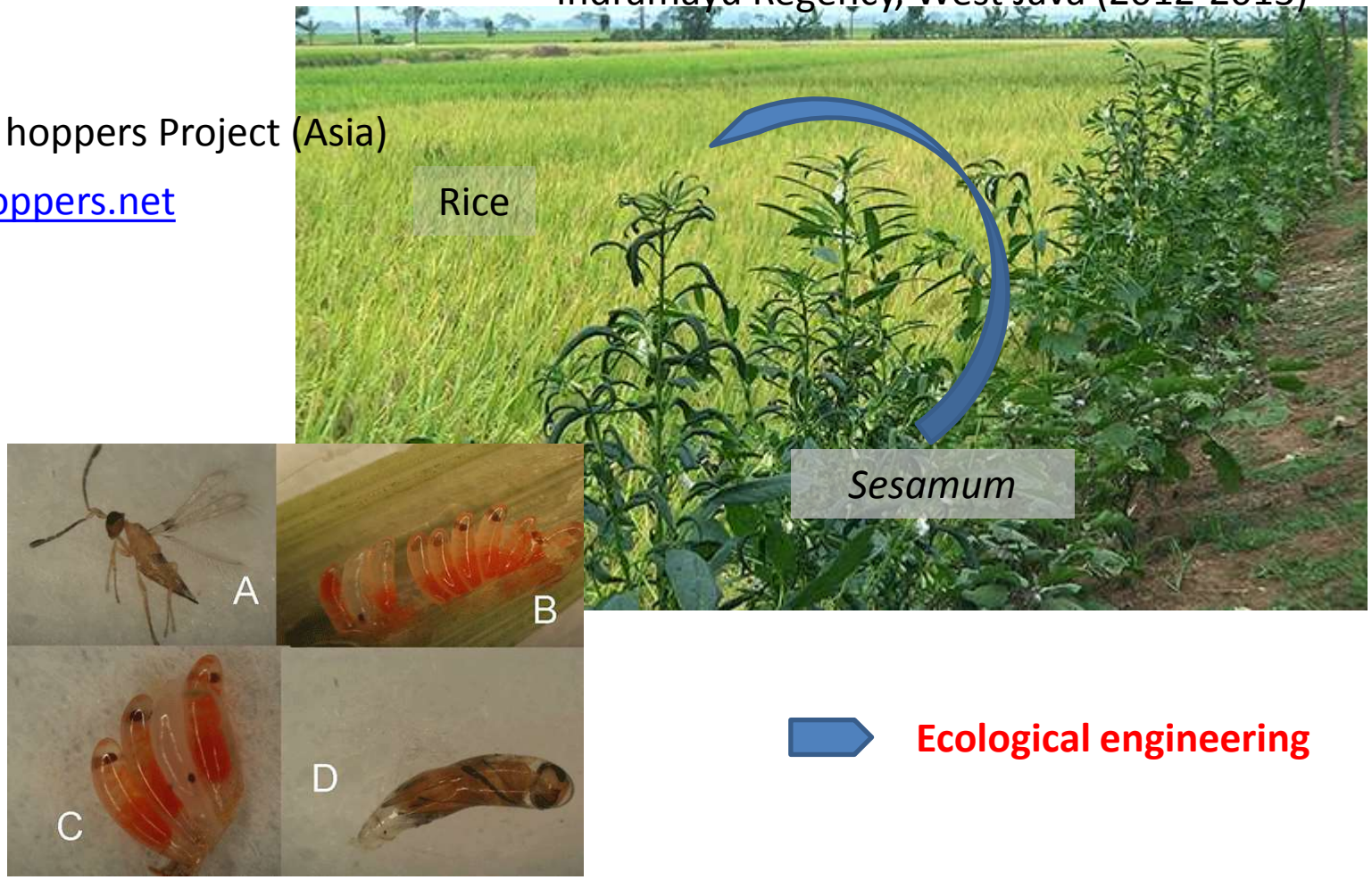
Field margins management ?

Example

Indramayu Regency, West Java (2012-2013)

Source: plant hoppers Project (Asia)

http://ricehoppers.net



Ecological engineering

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Some Networks

DIVECOSYS – Platform in Partnership for research and training

"Diversity of cropping systems and ecologically-based pest management in West Africa"

http://www.divecosys.org

Programme Régional de Production Intégrée du Coton en Afrique

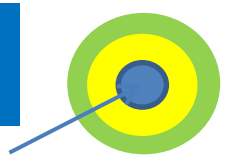
http://www.prpica.org/

Plantes Pesticides d'Afrique francophone (PPAf)

https://www.divecosys.org/actualites/le-projet-knomana-demarre

+ IITA - AfricaRice - CIMMYT - ICRISAT

Networking



Surname	Name	Institution	Country	Topic potentially studied on FAW
GOERGEN	Georg	IITA	Benin and other countries	Entomology
GNANKINE	Olivier	Université Ouaga I	Burkina Faso	
OUMAROU	Yacouba	Université de Maroua	Cameroun	
OCHOU	Germain Ochou	CNRA	Côte d'Ivoire	
TERETA	Idrissa	IER	Mali	Cotton entomology
BA	Malick	ICRISAT	Niger	IPM (Cereals)
GARBA	Madougou	DPV	Niger	
BAOUA	Ibrahim	INRAN	Niger	
TOGOLA	Abou	IITA	Nigeria	Entomology
BOLEVANE	Serge Florent	ISDR Bangui	Central African Republic	Biological control
BANI	Grégoire	IRA Brazzaville	Republic of Congo	Entomology
COLY	Emile	DPV	Senegal	
NDIAYE	Abdoulaye	DPV	Senegal	
BADIANE	Djibril	ISRA	Senegal	IPM (Cotton)
SARR	Ibrahima	ISRA	Senegal	IPM (Cereals)
BAL	Amadou Bocar	UGB	Senegal	IPM (Cereals)
SEMBENE	Mbacké	UCAD	Senegal	Populational genetics
SINE	Bassirou	CERAAS	Senegal	
DJIBA	Saliou	ISRA Ziguinchor	Senegal	IPM (rice) - entomology
DJINODJI	Reoungal	ITRAD Bébedjia	Chad	Agroeconomy
NDIAYE	Mbaye	Agrhymet		

And more…

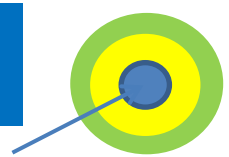
Networking

Using the ITC

Other Institutions

Surname	Name	Institution	Country	Topic potentially studied on FAW
BALARABE	Oumarou	CIRAD	Benin	Interactions fertilization-damage (cotton-based cropping systems)
MENOZZI	Philippe	CIRAD	Côte d'Ivoire	IPM (cotton)
CHAPUIS	Marie-Pierre	CIRAD	France	Genetic structure, behaviour and pests' microbiote
GOEBEL	François-Régis	CIRAD	France	Sugar cane, maize, rice, sorghum (knowlegde on *S.littoralis* and *S.exigua)*.
HARAN	Julien	CIRAD	France	Integrative Taxonomy (pests and beneficials)
JOLY	Hélène	CIRAD	France	Plant Resistance (sorghum)- Interactions with smallholders
MARTIN	Pierre	CIRAD	France	Knowledge management
PIOU	Cyril	CIRAD	France	Modelization
SILVIE	Pierre	IRD/CIRAD	France	Effects of plant extracts or essential oils & IPM
VOLKOFF	Anne-Nathalie	INRA Montpellier	France	Interactions insects/virus, biocontrol
d'ALENÇON	Emmanuelle	UM Montpellier	France	Genome of reference- Genome Evolution
CAMBRAY	Guillaume	INRA Montpellier	France	Molecular manipulation of small virus pathogenic to FAW
DUVIC	Bernard	INRA Montpellier	France	Interactions between *Spodoptera* and genus *Steinernema*
NAM	Kiwoong	INRA Montpellier	France	Populational Genomics
NEGRE	Nicolas	UM Montpellier	France	Genome expression and regulation
OGLIASTRO	Mylène	INRA Montpellier	France	Interactions insects/virus, biocontrol
ZEDDAM	Jean-Louis	IRD Montpellier	France	Entomo-virology
DELETRE	Émilie	CIRAD	Kenya	Sexual pheromones
MARNOTTE	Pascal	CIRAD	La Réunion	Weeds Taxonomy
DELMAS	Patrick	RECA	Niger	Interactions with smallholders
BREVAULT	Thierry	CIRAD	Sénégal	IPM (cotton - cereals)
LLANDRES	Ana Lopez	CIRAD	Sénégal	Tri-trophic interactions: plant-pest-predator, role of nectaries (beneficials attraction)

Networking (Zoom 1)



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Networking (Zoom 2)

CHAPUIS	Marie-Pierre	CIRAD	France	Genetic structure, behaviour and pests' microbiote
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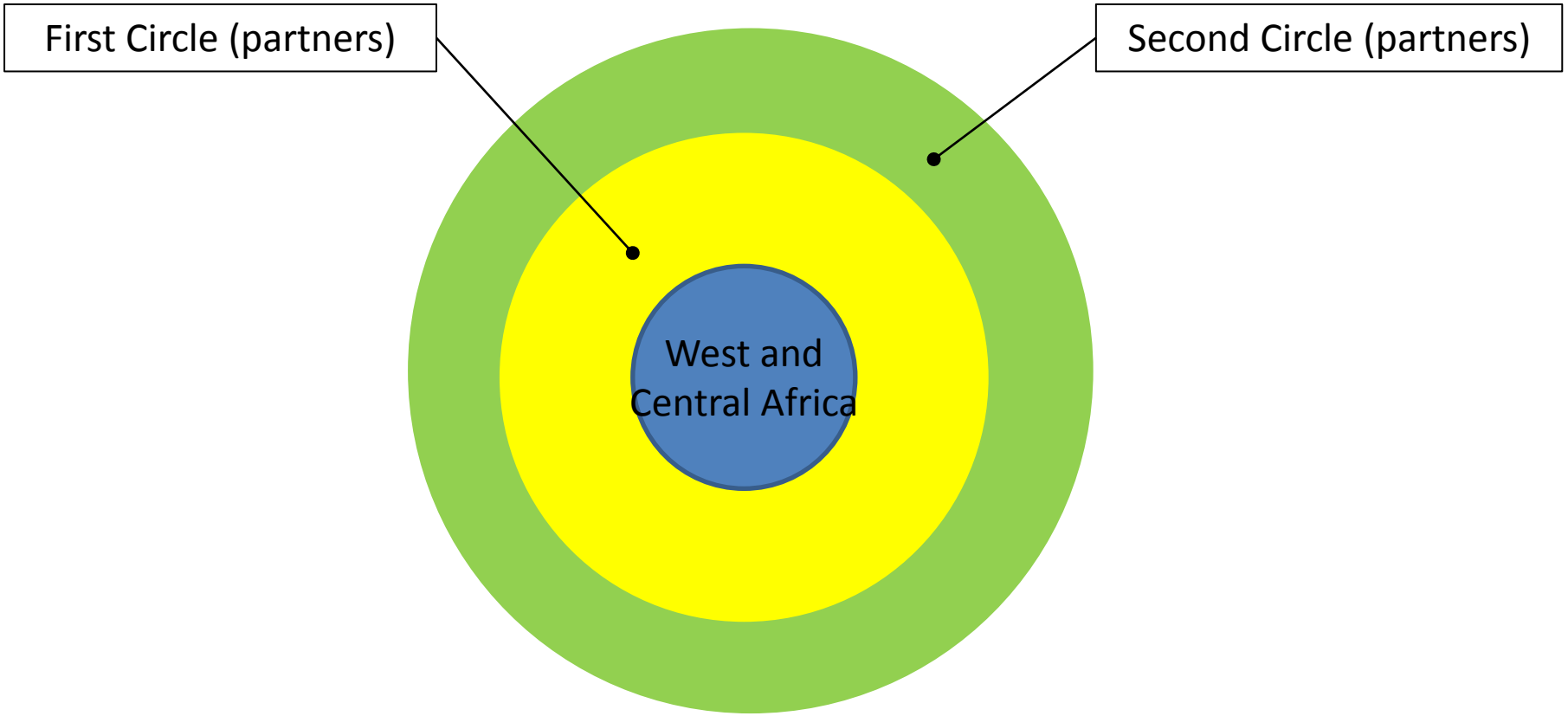
Networking



- To characterize each agroecosystem/FAW
- To characterize the climatic context
- To characterize the modalities of infestations (modelling –forecasting)
- To explore agro ecological practices - ecological engineering